2025

“Immigration, Search and Redistribution: A Quantitative Assessment of Native Welfare:” Comment

By ODED STARK *and* LUKASZ BYRA

Reprinted from

JOURNAL OF THE EUROPEAN ECONOMIC ASSOCIATION

"IMMIGRATION, SEARCH AND REDISTRIBUTION: A QUANTITATIVE ASSESSMENT OF NATIVE WELFARE:" COMMENT

Oded Stark
University of Bonn, Germany
University of Warsaw, Poland

Lukasz Byra
University of Warsaw, Poland

Abstract
In "Immigration, search and redistribution: A quantitative assessment of native welfare," a paper by Battisti et al. published in the August 2018 issue of the *Journal of the European Economic Association*, the authors inquire about how migration to 20 Organization for Economic Cooperation and Development (OECD) countries affects the welfare of the countries' native workers. In this comment, we raise several concerns regarding the analytical and the empirical parts of the Battisti et al.'s inquiry that bear on this effect. In particular, when Battisti et al. formulate a rule for the division between a worker and a firm of the surplus that arises from a firm-worker match, Battisti et al. neglect to take into account the fact that wages are taxed. When Battisti et al. formulate the GDP identity, the incorporation of capital is done incorrectly. Calibration of a corrected model undertaken in this comment reveals that these issues affect measurably the empirical results regarding the impacts on the welfare of native workers of skill-neutral migration and of migration by low-skill workers. An additional concern is that our calibration of a corrected model yields estimates of the tax rate on workers' wages that are far too high to be considered feasible. This suggests to us that even when the model of Battisti et al. is corrected, a structural revision is deemed necessary in order to deliver a useful tool for measuring the effect of migration on the welfare of native workers in the 20 OECD countries. As a step in this direction, we calibrate a version of the corrected model, which involves "reasonable" tax rates on wages and a budget deficit. The results yielded by this counterfactual version lend support to the results of the corrected model regarding the negative impact of skill-neutral migration and of migration by low-skill workers on the welfare of native workers. (JEL: F22, I31, J64)

The editor in charge of this paper was Thierry Mayer.

Acknowledgments: We are indebted to the reviewers for thoughtful comments, and to Thierry Mayer for advice, guidance, dedication, and close attention to detail. Lukasz Byra acknowledges financial support from the National Science Center, Poland (grant number 2018/29/N/HS4/00320).

E-mail: ostark@uni-bonn.de (Oded Stark); l.byra@uw.edu.pl (Lukasz Byra)

Journal of the European Economic Association 2025 0(0):1–18
https://doi.org/10.1093/jeea/jvaf033

1. Introduction

In "Immigration, search and redistribution: A quantitative assessment of native welfare," published in the August 2018 issue of the *Journal of the European Economic Association* (*JEEA*), Battisti et al. study the effect of migration to the 20 Organization for Economic Cooperation and Development (OECD) countries on the welfare of native workers in these countries. In the analytical part of their paper, Battisti et al. present a model that has the following key features. Output is produced by combining physical capital, low-skill work, and high-skill work; the economy's labor market is characterized by search frictions; upon a successful job search, a firm-worker match is established, and the firm and the worker divide between them the surplus arising from the match; the government levies taxes on workers and makes social welfare transfers to workers. In the empirical part of their paper, Battisti et al. calibrate the model and quantify the repercussions of several migration scenarios ("migration shocks") for the welfare of the countries' native workers. Inter alia, Battisti et al. assess the impact of skill-neutral migration and of migration by low-skill workers on the welfare of native workers. In this comment, we raise several concerns regarding the analytical and the empirical parts of the Battisti et al.'s paper.

When Battisti et al. formulate a rule for the division between worker and firm of the surplus that is obtained from a firm-worker match, Battisti et al. neglect to take into account the fact that wages are taxed. This omission is significant because, in their paper, a tax levied on wages is the only source of revenue that finances social welfare provisions. Once this omission is corrected, recalibrated values of the parameters and the endogenously determined variables of the Battisti et al.'s model turn out to differ measurably from the values reported by Battisti et al. themselves. Most notably, as shown in Table 1, when the division rule error in the Battisti et al.'s model is corrected, the ratio of the number of vacancies to the number of unemployed workers turns out to be higher by approximately two thirds in each of the 20 OECD migration-destination countries. When Battisti et al. specify the contribution of capital income (the income received by owners of capital) in the GDP identity, they do that incorrectly as well. Their formulation of aggregate capital income as a fraction of the marginal product of capital instead of as a fraction of output results in a 60% overestimation of the quantity of capital and in an equally large overestimation of wages in each of the 20 OECD migration-destination countries and, on average for these countries, in a 26-percentage-point underestimation of the tax rate.

On two major counts, the preceding two issues turn out to be particularly consequential because they bear measurably on the empirical results of Battisti et al. First, the issues influence how migration affects the welfare of native workers in the 20 OECD countries. Whereas upon calibration of their model Battisti et al. find that, for the majority of the 20 OECD countries and on average for these countries, migration that mirrors in its skill composition the skill composition of the incumbent migrant population (skill-neutral migration) is beneficial to native workers, our calibration

of a corrected model reveals that, for the majority of the 20 OECD countries and on average for these countries, skill-neutral migration is harmful to native workers. With regard to the migration of low-skill workers, which Battisti et al. find to be harmful to native low-skill workers and beneficial to native high-skill workers, once the model is corrected and recalibrated, the migration of low-skill workers turns out to be harmful to native workers of both skill types. Second, the corrected, recalibrated model yields tax rates on workers' wages that are far too high to be considered feasible, ranging for the 20 OECD countries between 52% and 82%, with the average for these countries of 72%. This finding renders it necessary to subject the model of Battisti et al. to structural revision: introduce ways of financing government expenditures other than taxation of the wages of workers so as to render the model a viable tool for measuring the effect of migration on the welfare of native workers in the 20 OECD countries.

In the next two sections, we address in detail the aforementioned two issues. In Section 2, we elaborate on the errors in the rule of the sharing of the firm-worker match surplus and in the GDP identity, and we list several less significant errors and inconsistencies in the Battisti et al.'s paper. In Section 3, we inquire into how the errors elucidated in Section 2 affect the soundness of the empirical results reported by Battisti et al., we provide results based on a corrected, recalibrated model, and we present a partial solution to the misspecification problem of Battisti et al. In Section 4, we present concluding remarks. Reflections that expand and supplement our reasoning in the main text are relegated to the appendix.

2. Analytical and Coding Shortcomings in the Battisti et al.'s Paper

2.1. Rule of Sharing the Firm-Worker Match Surplus

In the analytical part of their paper, Battisti et al. construct a framework in which, in particular, wage is the outcome of bargaining between firms and workers, and income is redistributed through unemployment benefits and social welfare transfers. When configuring a rule for dividing between worker and firm the surplus obtained from a firm-worker match, Battisti et al. present equation (10) of their paper, which we next replicate as equation (1) (for the sake of brevity, we omit from the Battisti et al.'s formulation subscript i, which indicates a worker's skill type, high or low, $i = H, L$, and subscript j, which denotes the worker's nationality, native or (im)migrant, $j = N, I$):

$$(1 - \beta)(J^E - J^U) = \beta J^F, \tag{1}$$

where β is a measure of the bargaining power of a worker, and J^E, J^U, and J^F are, respectively, the value to a worker of his employment, the value to a worker of his unemployment, and the value to a firm of a filled job.

We argue that Battisti et al.'s equation (10), which is our equation (1) above, is incorrect. The correct equation would be

$$(1-\beta)(J^E - J^U) = \beta(1-t)J^F, \tag{2}$$

where t is the proportional tax rate of a worker's wage. Our reasoning, which incidentally aligns with the representation in Pissarides (1985, p. 125) and with the exposition in a textbook on labor economics (Cahuc et al. 2014, p. 763), is presented in Appendix part A.1: "Wage bargaining when wages are taxed."

2.2. GDP Identity

Supplementary files provided by Battisti et al. and made available at the *JEEA* website contain the code used for calibrating the model constructed in Section 3 of their paper for the 20 OECD countries and, in particular, for studying the consequences of different types of migration for the welfare of native workers in these countries. Inspection of the supplementary files of the Battisti et al.'s paper reveals that the code for calibrating the model contains a significant mistake, as well as several other, less serious, mistakes. In this section, we refer to the significant mistake. In Section 2.3, we address the others.

Battisti et al. make use of an identity that states that the GDP of a country is a sum of workers' wage income (WI), net of income tax (IT), capital income (CI), and government expenditures (GE). This identity implicitly states that firms' aggregate profits net of aggregate vacancy costs (VC) are 0, so they do not need to be included in the GDP identity; thus, $GDP \equiv Y - VC = WI - IT + CI + GE$, where Y is output. In fact, this identity can be simplified by deleting $GE - IT$ because, on account of a balanced-budget constraint, this difference is 0. Hence, we can have just $GDP = WI + CI$. The error in the calibration code seems to have arisen from an incorrect specification of CI: Battisti et al. set $CI = \alpha^2 Y/K = \alpha MPK$ (where α is the share of the capital input in the inputs that combine to produce the output, K is capital, and MPK is the marginal product of capital), whereas the correct specification would be $CI = \alpha Y$. Analytical consequences of the misspecification of CI in the GDP identity are spelled out in Appendix part A.2: "Remarks on the misspecification of capital income in the GDP identity."

2.3. Other Shortcomings

Aside from the two significant mistakes presented in the preceding two sections, we identify here three problems/inconsistencies in the paper of Battisti et al. that, while having little bearing on the results reported there, nonetheless deserve mention and require amendment. We comment on these three problems and explain how we have addressed them in our recalibration.

(a) On p. 1156 of their paper, Battisti et al. write that they set the vacancy cost in the low-skill intensive intermediate-goods sector, c_L, at 0.5. However, in their calibration code, that parameter is set at 0.421. Our recalibration uses the latter value.

(b) When they consider two alternative "migration shocks," a skill-neutral migration (Section 4.2.1 in the Battisti et al.'s paper) and the migration of low-skill workers (Section 4.2.2 in that paper), Battisti et al. claim on p. 1162 that in both cases the inflow of migrants is equally large and amounts to "1 percentage point of the labor force." While measuring the magnitude of an increase of a parameter/variable that is not expressed in percentage points in terms of percentage points is unappealing in and of itself, inspection of the code of Battisti et al. reveals that between Sections 4.2.1 and 4.2.2, the increase is in fact different. In Section 4.2.1, the "migration shock" amounts to an increase in the stock of migrants such that, after the "shock," the population of migrants in a country as a percentage of the population of the native workforce in the country is larger by 1 percentage point. In Section 4.2.2, the "migration shock" is an increase in the stock of migrants in a country by 1% of the premigration population (native and migrant combined) living in the country. These two values are not the same; the former is larger than the latter. In our recalibration we use two distinct increases in the stock of migrants.

(c) Whereas Battisti et al. state that in their analysis in Section 4.2.2 the government provides two types of welfare assistance - an unemployment benefit and a universal social welfare transfer - the code that Battisti et al. actually use encompasses three types of welfare assistance: the preceding two, as well as a "nonrival (or 'pure') public good" (Battisti et al., p. 1169), which, according to the exposition in the Battisti et al.'s paper, should "show up" only in Section 4.3.2 of their paper. However, in Section 4.2.2 of their paper, Battisti et al. include the public good in the equations that characterize government expenditures (the balanced-budget constraint and the GDP identity), yet they neglect to include the public good in the equations that characterize workers' welfare (variants of equation (15) in the Battisti et al.'s paper for $i = H, L$ and $j = N, I$). To adjust for this inconsistency, in our recalibration we abstract from a public good.

3. Empirical Inquiry

To assess whether the incorrectly specified rule of sharing the match surplus and the GDP identity error influence the simulation results of Battisti et al., we calibrate a corrected version of their model and quantify the repercussions of the two errors for the results of the empirical inquiry reported in Sections 4.2.1 and 4.2.2 of the Battisti et al.'s paper: the impact on the welfare of native workers in the 20 OECD countries of skill-neutral migration and low-skill migration.

3.1. Recalibration

Table 1 displays the averages for the 20 OECD countries of the model's parameters and variables calibrated under four regimes: the original setting of Battisti et al. (column 2), the setting in which the match surplus-sharing rule is corrected and only the GDP

TABLE 1. Average recalibration results of Battisti et al.'s model for the 20 OECD countries.

1	2	3	4	5
Parameter/ variable	Original Battisti et al.'s model	Only GDP identity error is prevalent	Only match surplus-sharing rule error is prevalent	Both (columns 3 and 4) errors corrected
b_{LN}	0.166	0.166	0.055	0.053
b_{LI}	0.142	0.142	0.047	0.046
b_{HN}	0.250	0.250	0.083	0.080
b_{HI}	0.219	0.219	0.073	0.071
s_{LN}	0.030	0.030	0.030	0.030
s_{LI}	0.050	0.050	0.050	0.050
s_{HN}	0.016	0.016	0.016	0.016
s_{HI}	0.035	0.035	0.035	0.035
A	0.569	0.575	0.426	0.431
c_H	0.723	0.645	0.846	0.645
h_{LI}	–0.973	–0.514	–0.617	–0.152
h_{HI}	–1.602	–0.799	–1.054	–0.239
x	0.514	0.517	0.513	0.517
ξ	0.419	0.345	0.618	0.433
g	0.356	0.356	0.364	0.365
w_{LN}	0.789	0.789	0.500	0.495
w_{LI}	0.670	0.670	0.425	0.421
w_{HN}	1.198	1.198	0.760	0.751
w_{HI}	1.045	1.045	0.662	0.655
p_L	0.812	0.830	0.508	0.521
p_H	1.217	1.232	0.766	0.773
K	62.610	63.702	38.007	38.676
θ_L	1.240	1.653	0.607	1.010
θ_H	1.664	2.250	0.815	1.387
t	0.455	0.455	0.709	0.717

Note: b - unemployment benefit; s - worker-job separation rate; A - total factor productivity in the production function; c_H - cost of high-skill vacancy; h - utility value of not working; x - productivity parameter; ξ - efficiency parameter of the matching function; g - social transfer; w - wage rate; p - price of intermediate goods; K - quantity of capital; θ - ratio of number of vacancies to number of unemployed workers; and t - tax rate. Subscripts L, H, N, and I denote, respectively, low-skill workers or intermediate-goods sector, high-skill workers or intermediate-goods sector, native workers, and (im)migrant workers.

error is prevalent (column 3), the setting in which the GDP identity error is corrected and only the match surplus-sharing rule error is prevalent (column 4), and the setting in which both these errors are corrected (column 5). The impact of a particular error on the calibrated values of the model's parameters and variables is measured as a difference between the value of a parameter/variable in the fully corrected model (column 5) and the value of a parameter/variable in the model when the particular error (and not the other error) is left uncorrected (column 3 or column 4). For example, to evaluate the impact of the GDP identity error on the calibrated values of the model's parameters and variables, we compare column 3 with column 5. Our treatment of the other, less bothersome shortcomings in the Battisti et al.'s paper that we have listed in Section 2.3 aligns our recalibration code with the code of Battisti et al. rather than with the text

of the Battisti et al.'s paper. This alignment ensures that the differences in the values of parameters/variables between the columns of Table 1 are due solely to the match surplus-sharing rule error and/or to the GDP identity error, rather than to any of the less bothersome shortcomings.

A comparison of column 4 with column 5 reveals that, on average for the 20 OECD countries, the match surplus-sharing rule error has a noticeable impact on the ratios of the number of vacancies to the number of unemployed workers, θ_L and θ_H, the utility values of not working, h_{LI} and h_{HI}, the efficiency parameter of the matching function, ξ, and the cost of a high-skill vacancy, c_H, but no impact on wages. In turn, a comparison of columns 3 and 5 in Table 1 reveals that on account of the prevalent GDP identity error, Battisti et al. overestimate wages, w_{LN}, w_{HN}, w_{LI}, and w_{HI}, prices, p_L and p_H, and the quantity of physical capital, K, in each of the 20 OECD countries by approximately 60%; further, Battisti et al. underestimate the average tax rate for the 20 OECD countries by 26 percentage points. The mechanisms that give rise to the aforementioned adjustments are discussed in Appendix part A.3: "Intuition on the impact of analytical and coding shortcomings of the Battisti et al.'s paper on the calibration results."

3.2. Impact of "Migration Shocks" on the Welfare of Native Workers in the Recalibrated Model

To assess the empirical consequences of the errors in the rule of sharing the match surplus and in the GDP identity, we next consider the effect on the welfare of native workers of the two "migration shocks" studied by Battisti et al. in Sections 4.4.1 and 4.2.2 of their paper. These "migration shocks" represent an increase in the stock of migrants such that the migrant population as a percentage of the native population is made larger by one percentage point, holding the skill composition of the migrant population unchanged (skill-neutral migration), and an increase in the stock of low-skill migrants that amounts to 1% of the combined (native and migrant) labor force (migration by low-skill workers). An explanation of how the welfare of native workers is measured is presented in Appendix part A.4: "The measurement of the welfare of native workers."

In Tables 2 and 3, we assess the repercussions of correcting the errors that we identified in Section 2 of this comment. Tables 6 and 7 in the Battisti et al.'s paper summarize the results of, respectively, Sections 4.2.1 and 4.2.2 of their paper and, thus, serve as our benchmarks. In each of our next Tables 2 and 3, we display the effect of a "migration shock" on the welfare of native workers. In Table 2, we assess the effect of a skill-neutral inflow of migrants, and in Table 3 we assess the effect of the inflow of low-skill migrants. Each Table has seven columns. Column 1 lists the 20 OECD countries studied by Battisti et al. Columns 2 through 4 in our Table 2 replicate the estimates from Table 6 in the Battisti et al.'s paper. Columns 2 through 4 in our Table 3 replicate the estimates from Table 7 in the Battisti et al.'s paper. In each of our Tables, columns 5 through 7 present the counterparts of the estimates in columns 2 through 4

TABLE 2. Effect of skill-neutral migration on the welfare of native workers in the 20 OECD countries.

1	2	3	4	5	6	7
Country	Original results of Battisti et al.			Results in the fully corrected model		
	Low-skill native workers	High-skill native workers	Combined native workforce	Low-skill native workers	High-skill native workers	Combined native workforce
Australia	0.06%	–0.08%	0.01%	0.04%	–0.04%	0.01%
Austria	–0.03%	–0.03%	–0.03%	–0.08%	–0.11%	–0.09%
Belgium	–0.03%	–0.01%	–0.02%	–0.09%	–0.11%	–0.10%
Canada	0.08%	–0.08%	0.04%	0.05%	–0.03%	0.03%
Denmark	0.11%	–0.05%	0.06%	0.03%	–0.05%	0.00%
Estonia	0.07%	0.02%	0.05%	0.00%	–0.03%	–0.01%
France	0.00%	0.05%	0.02%	–0.07%	–0.07%	–0.07%
Germany	–0.03%	0.04%	–0.01%	–0.09%	–0.06%	–0.08%
Greece	0.02%	0.18%	0.07%	–0.08%	–0.06%	–0.07%
Ireland	0.10%	–0.03%	0.05%	0.03%	–0.03%	0.01%
Italy	0.05%	0.14%	0.07%	–0.03%	–0.01%	–0.03%
Luxembourg	–0.03%	–0.01%	–0.02%	–0.07%	–0.08%	–0.07%
Netherlands	–0.03%	0.02%	–0.01%	–0.06%	–0.05%	–0.06%
Portugal	0.09%	0.07%	0.08%	0.02%	0.01%	0.02%
Slovenia	–0.04%	0.17%	0.02%	–0.06%	0.07%	–0.03%
Spain	–0.01%	0.12%	0.04%	–0.09%	–0.05%	–0.07%
Sweden	–0.01%	–0.04%	–0.02%	–0.08%	–0.11%	–0.09%
Switzerland	–0.03%	–0.04%	–0.04%	–0.04%	–0.06%	–0.05%
United Kingdom	–0.03%	0.05%	0.00%	–0.05%	0.00%	–0.03%
United States	0.06%	0.03%	0.05%	0.03%	0.01%	0.02%
Average	**0.02%**	**0.03%**	**0.02%**	**–0.03%**	**–0.04%**	**–0.04%**
Median	0.00%	0.02%	0.02%	–0.05%	–0.05%	–0.04%

for the fully corrected model. In Table 2, the fully corrected model consists of a correction of the match surplus-sharing rule error and a correction of the GDP identity error. In Table 3, the fully corrected model consists of the preceding two corrections as well as a correction of the code inconsistency of Battisti et al., as per (c) in our Section 2.3.

The calculations reported in our Tables 2 and 3 reveal that the misspecifications in the Battisti et al.'s paper that we identified in Section 2 bear on the assessment of the impact of "migration shocks" - skill-neutral migration and migration of low-skill workers - for the welfare of native workers in the 20 OECD countries. In the Battisti et al.'s paper, skill-neutral migration has, on average for the 20 OECD countries, a positive effect on the welfare of all native workers: low-skill (0.02%), high-skill (0.03%), and combined (0.02%). These results are in contrast with the result yielded by the corrected model, as shown in columns 5 through 7 in our Table 2: skill-neutral migration negatively affects the welfare of all groups of native workers, on average for the 20 OECD countries (–0.03% for low-skill workers, –0.04% for high-skill workers, and –0.04% for the combined native workforce).

TABLE 3. Effect of low-skill migration on the welfare of low-skill native workers in the 20 OECD countries.

1	2	3	4	5	6	7
Country	Original results of Battisti et al.			Results in the fully corrected model		
	Low-skill native workers	High-skill native workers	Combined native workforce	Low-skill native workers	High-skill native workers	Combined native workforce
Australia	–0.15%	0.22%	–0.02%	–0.13%	0.06%	–0.07%
Austria	–0.07%	0.19%	–0.02%	–0.13%	–0.03%	–0.11%
Belgium	–0.14%	0.15%	–0.04%	–0.19%	–0.11%	–0.16%
Canada	–0.11%	0.21%	–0.03%	–0.12%	0.03%	–0.08%
Denmark	–0.08%	0.21%	0.01%	–0.13%	–0.03%	–0.10%
Estonia	–0.11%	0.21%	0.01%	–0.13%	0.00%	–0.09%
France	–0.07%	0.20%	0.02%	–0.14%	–0.08%	–0.12%
Germany	–0.10%	0.20%	–0.01%	–0.15%	0.00%	–0.11%
Greece	0.00%	0.29%	0.09%	–0.12%	–0.08%	–0.11%
Ireland	–0.18%	0.15%	–0.05%	–0.17%	–0.08%	–0.14%
Italy	0.04%	0.31%	0.09%	–0.08%	0.03%	–0.06%
Luxembourg	–0.16%	0.13%	–0.05%	–0.15%	–0.10%	–0.13%
Netherlands	–0.12%	0.18%	–0.02%	–0.15%	–0.01%	–0.10%
Portugal	–0.06%	0.26%	0.02%	–0.13%	–0.01%	–0.10%
Slovenia	–0.07%	0.26%	0.03%	–0.10%	0.10%	–0.05%
Spain	–0.12%	0.21%	0.01%	–0.16%	–0.05%	–0.12%
Sweden	–0.12%	0.16%	–0.03%	–0.16%	–0.06%	–0.13%
Switzerland	–0.17%	0.20%	–0.03%	–0.17%	0.08%	–0.08%
United Kingdom	–0.19%	0.20%	–0.02%	–0.19%	0.03%	–0.10%
United States	–0.12%	0.24%	0.02%	–0.16%	–0.01%	–0.11%
Average	**–0.10%**	**0.21%**	**0.00%**	**–0.14%**	**–0.02%**	**–0.10%**
Median	–0.11%	0.20%	–0.02%	–0.14%	–0.01%	–0.10%

Battisti et al. find that migration by low-skill workers has a negative effect on the welfare of low-skill native workers (–0.10%), a positive effect on the welfare of high-skill native workers (0.21%), and a neutral effect on the welfare of the combined native workforce (0.00%). As seen in columns 5 through 7 in our Table 3, correction of the two errors retains the sign of the effect for low-skill native workers, although the effect is larger (–0.14%), while for high-skill native workers the sign of the effect changes from positive to negative (–0.02%). Consequently, the effect of low-skill migration on the welfare of the combined native workforce is also negative (–0.10%).

3.3. Partial Solution to the Problem of Excessive Taxation of Wages in the Recalibrated Model

The results that we obtained for a corrected version of the model should be approached with caution because in and of itself, the model of Battisti et al. is in need of better specification. This shortcoming manifests itself in the fact that calibration of a

TABLE 4. Average recalibration results of Battisti et al.'s model for the 20 OECD countries.

1	2	3	4
Parameter/ variable	Original Battisti et al.'s model	Fully corrected model	Counterfactual model
b_{LN}	0.166	0.053	0.105
b_{LI}	0.142	0.046	0.089
b_{HN}	0.250	0.080	0.157
b_{HI}	0.219	0.071	0.138
s_{LN}	0.030	0.030	0.030
s_{LI}	0.050	0.050	0.050
s_{HN}	0.016	0.016	0.016
s_{HI}	0.035	0.035	0.035
A	0.569	0.431	0.431
c_H	0.723	0.645	0.645
h_{LI}	–0.973	–0.152	–0.314
h_{HI}	–1.602	–0.239	–0.499
x	0.514	0.517	0.517
ξ	0.419	0.433	0.433
g	0.356	0.365	0.361
w_{LN}	0.789	0.495	0.495
w_{LI}	0.670	0.421	0.421
w_{HN}	1.198	0.751	0.751
w_{HI}	1.045	0.655	0.655
p_L	0.812	0.521	0.521
p_H	1.217	0.773	0.773
K	62.610	38.676	38.676
θ_L	1.240	1.010	1.010
θ_H	1.664	1.387	1.387
t	0.455	0.717	0.455
BD			0.170

Note: b - unemployment benefit; s - worker-job separation rate; A - total factor productivity in the production function; c_H - cost of high-skill vacancy; h - utility value of not working; x - productivity parameter; ξ - efficiency parameter of the matching function; g - social transfer; w - wage rate; p - price of intermediate goods; K - quantity of capital; θ - ratio of number of vacancies to number of unemployed workers; and t - tax rate; BD - budget deficit. Subscripts L, H, N, and I denote, respectively, low-skill workers or intermediate-goods sector, high-skill workers or intermediate-goods sector, native workers, and (im)migrant workers.

corrected version of the Battisti et al.'s model yields taxation rates of workers' wages that cannot be considered feasible: they range between 52% and 82%, with the average for the 20 OECD countries being 72% (consult Table 1). Simulating an economy's response to any "shock" when the values of the calibrated parameters/variables differ significantly from real-world magnitudes is not very revealing.

The problem of excessive taxation of workers in the fully corrected model leads us to ask the following question: what is the cause of the difference between the results obtained by Battisti et al. and the results obtained in the fully corrected model as presented in Tables 2 and 3 of this comment? Is it the correction of the analytical and coding shortcomings of the Battisti et al.'s paper, or is it an excessive taxation of the workers in the fully corrected model, so that the difference would be no more if workers were "reasonably" taxed? Although a full implementation of this possibility

TABLE 5. Effect of skill-neutral migration on the welfare of native workers in the 20 OECD countries.

1	2	3	4	5	6	7
Country	Original results of Battisti et al.			Results of the counterfactual model		
	Low-skill native workers	High-skill native workers	Combined native workforce	Low-skill native workers	High-skill native workers	Combined native workforce
Australia	0.06%	–0.08%	0.01%	–0.15%	–0.31%	–0.20%
Austria	–0.03%	–0.03%	–0.03%	–0.24%	–0.30%	–0.25%
Belgium	–0.03%	–0.01%	–0.02%	–0.24%	–0.28%	–0.25%
Canada	0.08%	–0.08%	0.04%	–0.14%	–0.35%	–0.19%
Denmark	0.11%	–0.05%	0.06%	–0.11%	–0.30%	–0.17%
Estonia	0.07%	0.02%	0.05%	–0.16%	–0.26%	–0.19%
France	0.00%	0.05%	0.02%	–0.23%	–0.25%	–0.24%
Germany	–0.03%	0.04%	–0.01%	–0.23%	–0.21%	–0.22%
Greece	0.02%	0.18%	0.07%	–0.22%	–0.20%	–0.22%
Ireland	0.10%	–0.03%	0.05%	–0.13%	–0.31%	–0.20%
Italy	0.05%	0.14%	0.07%	–0.17%	–0.17%	–0.17%
Luxembourg	–0.03%	–0.01%	–0.02%	–0.33%	–0.40%	–0.36%
Netherlands	–0.03%	0.02%	–0.01%	–0.21%	–0.22%	–0.21%
Portugal	0.09%	0.07%	0.08%	–0.13%	–0.23%	–0.15%
Slovenia	–0.04%	0.17%	0.02%	–0.19%	–0.05%	–0.15%
Spain	–0.01%	0.12%	0.04%	–0.23%	–0.20%	–0.22%
Sweden	–0.01%	–0.04%	–0.02%	–0.24%	–0.31%	–0.26%
Switzerland	–0.03%	–0.04%	–0.04%	–0.19%	–0.23%	–0.21%
United Kingdom	–0.03%	0.05%	0.00%	–0.18%	–0.16%	–0.17%
United States	0.06%	0.03%	0.05%	–0.11%	–0.22%	–0.15%
Average	**0.02%**	**0.03%**	**0.02%**	**–0.19%**	**–0.25%**	**–0.21%**
Median	0.00%	0.02%	0.02%	–0.19%	–0.24%	–0.20%

is beyond the scope of this comment, we nonetheless outline a simple validation test of the possibility. We do this by setting up a counterfactual version of the model of Battisti et al., which is the same as the fully corrected model except that it features "reasonable" tax rates of wages. These tax rates are too low to fully pay for the countries' social expenditures, thereby resulting in budget deficits in each of the 20 OECD countries. The incorporation of the budget deficit into the balanced budget constraint is explained in Appendix part A.5: "The counterfactual model." (We do not delve into the issue of how the budget deficits are to be financed.) We then calibrate the counterfactual model, study the impact of the two "migration shocks" on the welfare of native workers in the 20 OECD countries, and compare this impact both with the original results of Battisti et al. and with the results obtained in the fully corrected model.

The calibration results of the counterfactual model, along with the original calibration results of Battisti et al. (column 2 in Table 1) and the results of the fully corrected model (column 5 in Table 1) are presented in Table 4. Inspection of Table 4 indicates that in the counterfactual model, the values of the model's

TABLE 6. Effect of low-skill migration on the welfare of native workers in the 20 OECD countries.

1	2	3	4	5	6	7
Country	Original results of Battisti et al.			Results of the counterfactual model		
	Low-skill native workers	High-skill native workers	Combined native workforce	Low-skill native workers	High-skill native workers	Combined native workforce
Australia	–0.15%	0.22%	–0.02%	–0.29%	–0.03%	–0.20%
Austria	–0.07%	0.19%	–0.02%	–0.25%	–0.09%	–0.22%
Belgium	–0.14%	0.15%	–0.04%	–0.31%	–0.14%	–0.25%
Canada	–0.11%	0.21%	–0.03%	–0.26%	–0.07%	–0.22%
Denmark	–0.08%	0.21%	0.01%	–0.27%	–0.09%	–0.21%
Estonia	–0.11%	0.21%	0.01%	–0.27%	–0.07%	–0.20%
France	–0.07%	0.20%	0.02%	–0.28%	–0.13%	–0.23%
Germany	–0.10%	0.20%	–0.01%	–0.27%	–0.06%	–0.21%
Greece	0.00%	0.29%	0.09%	–0.24%	–0.12%	–0.21%
Ireland	–0.18%	0.15%	–0.05%	–0.33%	–0.13%	–0.25%
Italy	0.04%	0.31%	0.09%	–0.20%	–0.05%	–0.17%
Luxembourg	–0.16%	0.13%	–0.05%	–0.31%	–0.14%	–0.24%
Netherlands	–0.12%	0.18%	–0.02%	–0.28%	–0.07%	–0.21%
Portugal	–0.06%	0.26%	0.02%	–0.25%	–0.08%	–0.21%
Slovenia	–0.07%	0.26%	0.03%	–0.21%	0.03%	–0.15%
Spain	–0.12%	0.21%	0.01%	–0.28%	–0.09%	–0.21%
Sweden	–0.12%	0.16%	–0.03%	–0.30%	–0.11%	–0.24%
Switzerland	–0.17%	0.20%	–0.03%	–0.27%	0.02%	–0.17%
United Kingdom	–0.19%	0.20%	–0.02%	–0.31%	–0.04%	–0.20%
United States	–0.12%	0.24%	0.02%	–0.26%	–0.07%	–0.19%
Average	**–0.10%**	**0.21%**	**0.00%**	**–0.27%**	**–0.08%**	**–0.21%**
Median	–0.11%	0.20%	–0.02%	–0.27%	–0.08%	–0.21%

parameters/variables are either the same as in the fully corrected model, or they are somewhere in between their calibrated values in the original model of Battisti et al. and in the fully corrected model, with the exception of the tax rate, in which case the value of this rate is the same as in the original model of Battisti et al.

Tables 5 and 6 report the impact of the two "migration shocks" on the welfare of native workers in the 20 OECD countries in the counterfactual model (columns 5 through 7) and in the original model of Battisti et al. (columns 2 through 4). Comparisons of Table 5 with Table 2 and of Table 6 with Table 3 reveal that the impact of the two "migration shocks" on the welfare of native workers in the 20 OECD countries is less positive/more negative in the counterfactual model (where the tax rates on wages are "reasonable") than in the fully corrected model (where the tax rates are excessively high). That is, native workers in the 20 OECD countries stand to benefit less/lose more on account of the two migration shocks when the level of taxation of wages is low compared to when it is high. This result reveals that the level of the wage taxation is an important factor determining the magnitude of the impact of migration on the welfare of native workers in the 20 OECD countries. It also implies that the

difference between the original results of Battisti et al. and the results obtained in the fully corrected model cannot be explained by excessive taxation of the workers in the fully corrected model. (As mentioned in the last paragraph of Appendix part A.3, it appears that at least two distinct factors contribute to this difference.)

4. Concluding Remarks

We share the interest of Battisti et al. in deciphering the effect of migration on the earnings and welfare of native workers, and we consider this issue to lie at the forefront of research and debate on the consequences of migration. In this comment, we therefore focus on the validity of the claims that Battisti et al. make in this regard.

In Section 3, we showed that the errors identified in Section 2 of this comment have significant bearing on the simulation results of Battisti et al. And even when those errors are corrected, the model of Battisti et al. is subject to a misspecification problem. A possible solution to this problem is to introduce means of financing government expenditures other than a taxation of workers' wages. For example, almost all 20 OECD countries levy a value-added tax (except for the US, which, however, imposes sales taxes at the state level) at an average rate for the remaining 19 OECD countries (the 20 OECD countries except the US) of 19.8% in 2022 (OECD 2022, as per the data used for Figure 2.2 in that publication). Similarly, all 20 OECD countries imposed an average corporate income tax rate for the 20 OECD countries of 24.7% in 2023 (OECD 2024a, as per the data used for Figure 4.1 in that publication). Adjusting the modeling framework of Battisti et al. to include the value-added tax and/or the corporate income tax would result in lower calibrated values of the tax rate on workers' wages, possibly to actual levels of 39% on average for the 20 OECD countries in 2023 (OECD 2024b, Table 1.1).

Appendix

A.1. Wage Bargaining When Wages Are Taxed

When referring to the outcome of the process of wage bargaining between workers and firms, Battisti et al. (p. 1150) make the following statement: "The worker receives the share β of the total surplus of the match." Although this statement would have been true if wages were not taxed, the statement becomes inaccurate when wages are taxed.

Unlike Battisti et al., who introduce an exogenously determined rule for the division between a worker and a firm of the surplus that arises from the firm-worker match, we obtain such a rule endogenously from a Nash wage bargaining problem as follows:

$$\max_{w} \beta \ln(J^E(w) - J^U) + (1-\beta)\ln(J^F(w) - J^V), \tag{A.1}$$

where w is a worker's wage, and J^V is the value to a firm of an unfilled job. From the differentiation of (A.1) with respect to w, the first-order condition is

$$\beta \frac{\partial J^E(w)/\partial w}{J^E(w) - J^U} = (1-\beta)\frac{-\partial J^F(w)/\partial w}{J^F(w) - J^V}. \tag{A.2}$$

In line with Battisti et al., we next use the following additional notations: g is the lump-sum social welfare transfer that the government makes to a worker; r is the interest rate; k is capital per worker (capital is the other production factor used by firms); s is the worker's job separation rate; π is the worker's productivity; and p is the price of the intermediate goods (which can be low-skill intensive or high-skill intensive) produced by firms in the intermediate-goods sector and then sold by them to firms that produce the consumption good. Substituting for J^F from $(r+s)J^F(w) = \pi p - w$ and for J^E from $(r+s)J^E(w) = g + rk + (1-t)w + sJ^U$ (omitting subscripts ij and i), that is, upon substituting, respectively, the solutions to (7) and (8) in the Battisti et al.'s paper, allows us to calculate $\partial J^E(w)/\partial w = (1-t)/(r+s)$ and $\partial J^F(w)/\partial w = -1/(r+s)$, which we then use to transform (A.2) to

$$\beta \frac{1-t}{J^E(w) - J^U} = (1-\beta)\frac{1}{J^F(w) - J^V}, \tag{A.3}$$

which upon rearranging terms and utilizing $J^V = 0$, is equation (2).

The incorrectly specified match surplus-sharing rule "contaminates" the derivation of subsequent formulas in the Battisti et al.'s paper. Again, in line with the notation used in their paper, $m(\theta)$ denotes the arrival rate of jobs to unemployed workers, which is a function of the ratio of the number of vacancies to the number of unemployed workers, θ; b denotes the unemployment benefit; and h denotes the utility value of not working. The wage equation,

$$\begin{aligned} w = {} & \beta \frac{r+s+m(\theta)}{(r+s)\,[1-t(1-\beta)] + \beta m(\theta)}\pi p \\ & + (1-\beta)\frac{r+s}{(r+s)\,[1-t(1-\beta)] + \beta m(\theta)}(b+h), \end{aligned} \tag{A.4}$$

which in the Battisti et al.'s paper is displayed as (14), is incorrect; the correct wage equation, obtained from (A.3) upon utilizing

$$rJ^U = g + rk + \frac{(r+s)(b+h) + m(\theta)(1-t)w}{r+s+m(\theta)},$$

which in turn follows from solving (8) and (9) in the Battisti et al.'s paper, is

$$w = \beta \frac{r+s+m(\theta)}{r+s+\beta m(\theta)}\pi p + (1-\beta)\frac{r+s}{r+s+\beta m(\theta)}\frac{b+h}{1-t}. \tag{A.5}$$

A.2. Remarks on Misspecification of Capital Income in the GDP Identity

As a result of the GDP identity error, the model's calibration is effectively split into two: rather than having one set of equations that need to be simultaneously solved to calibrate all the values of the model's parameters and variables, with the GDP identity error looming, there are two distinct sets of equations for the calibration of two distinct sets of parameters and variables. To see this, we note that the rule governing the quantity of capital in the economy, $(r+\delta)K = \alpha Y$, which is equation (2) in the Battisti et al.'s paper, can be rearranged to yield $r+\delta = \alpha Y/K \equiv MPK$, indicating that MPK is fixed at $r+\delta$, which is the sum of the interest rate and the capital depreciation rate. When used in the incorrectly specified GDP identity, $GDP = WI + CI = WI + \alpha MPK$, the identity becomes $GDP = WI + \alpha(r+\delta)$. Battisti et al. impose or take from external sources the values of GDP, α, r, and δ (see Tables 2 and 3 in the Battisti et al.'s paper), leaving WI as the sole unknown in the GDP identity. That is, as a result of the incorrect specification of the GDP identity, the sum of the wage incomes of the workers in a country is uniquely determined by a system of just two equations - the GDP identity and the capital quantity rule. Such a partial calibration would not be possible under correct specification of the GDP identity: if $CI = \alpha Y$, then a substitution from $r+\delta = \alpha Y/K \equiv MPK$ into the GDP identity yields $GDP = WI + (r+\delta)K$, which has two unknowns, WI and K.

With WI calibrated, and drawing on several other conditions (the balanced-budget constraint, the equation stating that government expenditures in a country are equal to a share of the country's GDP, the native high-skill to native low-skill wage ratio, the migrant-native wage ratios by skill type, and the native/migrant unemployment benefit to net wage replacement rates by skill type), we obtain the tax rate t, the wages w_{ij}, the unemployment benefits b_{ij}, and the social welfare transfer g. A fallout of the incorrectly specified GDP identity is that these nine variables (t, w_{ij}, and b_{ij} for $i = H, L$ and $j = N, I$) and one parameter (g) are calibrated by Battisti et al. with no regard to the production technology, to the match surplus-sharing rule, or to the turnover in the labor market.

A.3. Intuition on the Impact of Analytical and Coding Shortcomings of the Battisti et al.'s Paper on the Calibration Results

The intuition on the significant impact of the match surplus-sharing rule error on the calibrated values of θ_L and θ_H, and the lack of impact on wages despite the divergence between (A.4) and (A.5), is as follows. Compared with equation (1), equation (2) indicates that the profits of firms with filled jobs are higher and/or the workers' wages are lower when the error is corrected compared to when it is not. Wages have little room for adjustment because in large part they are pegged by the (imposed) values of the GDP, (un)employment rates, the size and composition of the workforce, and the contribution of wage income in the GDP identity. Hence, the adjustment has to be in the profits of firms with filled jobs. Higher profits of firms with filled jobs incentivize the

formation of new firms with vacant jobs (the free entry condition), hence an increase in θ_L and θ_H.

To provide intuition on the impact of the GDP identity error on the calibrated values of wages, prices of intermediate goods, and the quantity of capital, we refer to data employed by Battisti et al. in their calibration. Combining data on GDP per capita with data on the size of the workforce for each of the 20 OECD countries yields, on average for these countries, $GDP \approx 1.0282$. Using the incorrectly specified GDP identity $GDP = WI + CI = WI + \alpha(r + \delta)$ to calculate WI and CI for each of the 20 OECD countries, we obtain that, on average for these countries, $WI \approx 1.0246$ and $CI \approx 0.0036$. That is, on account of the incorrectly specified GDP identity, Battisti et al. estimate the contribution of wage income to GDP at $WI/GDP \approx 99.65\%$ and the contribution of capital income to GDP at a mere $CI/GDP \approx 0.35\%$. In the corrected, recalibrated model, we obtain $WI \approx 0.6376$ and $CI \approx 0.3906$, which yield the contribution to GDP of wage income and the contribution to GDP of capital income at 62% and 38%, respectively.

Under the "auspices" of the GDP identity error, the model implies that virtually the entire GDP needs to be produced by workers. Because in the calibration exercise the size of the workforce, its composition, and the employment rates of the four groups of workers (native/migrant, low-skill/high-skill) are all fixed, the only available means of making workers generate more output is to endow them with more capital (or, more precisely, to combine intermediate goods that workers produce with more capital so as to augment the marginal products of the intermediate goods), hence the high quantity of capital in the Battisti et al.'s paper that maps onto prices of intermediate goods produced by workers and onto workers' wages. Correcting the GDP identity reinstates capital as a factor of production in its own right. Its quantity is reduced because when capital contributes to output, not only indirectly (by augmenting the marginal products of intermediate goods) but also directly, less of it is needed to create a given output. A reduction of the quantity of capital brings down the marginal products of the intermediate goods, the prices of the intermediate goods, and, eventually, workers' wages.

That a correction of the GDP identity error triggers an upward shift in the tax rate is intuitive. In the Battisti et al.'s paper, the tax levied on workers' wages is the only source of financing government expenditures, which on average for the 20 OECD countries constitute 45.3% of GDP (consult Table 3 in the Battisti et al.'s paper). Because of the incorrectly specified GDP identity, workers receive virtually all (99.65%) of the income generated in each of the 20 OECD countries, resulting in a financing of government expenditures at 45.3% of GDP by a 45.5% tax on wages (column 3 in Table 1). On average for the 20 OECD countries, correcting the GDP identity brings down the share of aggregate income that ends up in the hands of workers from almost 100% to 62%. In effect, financing government expenditures at 45.3% of GDP solely by taxing labor requires a much higher tax rate than the 45.5% arrived at by Battisti et al.

In Appendix part A.2, we noted that the incorrectly specified GDP identity splits the set of the equations used for the purpose of calibrating the model into two separate

subsets, which were solved independently of one another. That this is indeed the case can be seen from the data presented in our Table 1. Comparing the calibration results of Battisti et al. (column 2 in our Table 1) with our results in a context where the match surplus-sharing rule error is corrected but the GDP identity error is not corrected (column 3 in our Table 1), we can see that a correction of the match surplus-sharing rule affects the values of many of the model's parameters and variables, but not the tax rate, wage rates, unemployment benefits, and social welfare transfer. This is because when the GDP identity error is not corrected, the match surplus-sharing rule equation is outside the set of the equations required to calibrate the tax rate, wages, unemployment benefits, and the social welfare transfer.

The cause of the difference between the results yielded by the corrected model and the results yielded by the original model of Battisti et al., as displayed in Tables 2 and 3 of this comment, is not all that clear. This is because the cause gets blurred in the stacked shortcomings of the Battisti et al.'s paper. Correcting the match surplus-sharing rule error ought to impinge negatively on the welfare of native workers in the two "migration shocks" because this correction weakens the position of the workers during the process of wage bargaining. This weakening results in lower wages and, consequently, in reduced welfare. However, as mentioned in Appendix part A.2, with the GDP error in place, the calibration of wages in the Battisti et al.'s paper proceeds with no regard to the match surplus-sharing rule. In short, the mechanisms that determine wages and, therefore, the welfare of native workers in the corrected model and in the model of Battisti et al. are too different to allow comparison.

A.4. The Measurement of the Welfare of Native Workers

The level of welfare of native workers of a specific skill type, W_{LN} for low-skill workers and W_{HN} for high-skill workers, is calculated as per (15) in the Battisti et al.'s paper, that is, as per

$$W_{iN} = (1 - u_{iN})(1 - t)w_{iN} + u_{iN}(b_{iN} + h_{iN}) + rk_{iN} + g, \tag{A.6}$$

separately for each skill type, $i = L$ and $i = H$. We use (A.6) to calculate the average level of welfare of native workers, $W_{N,}$ as

$$W_N = W_{LN}Q_{LN} + W_{HN}Q_{HN},$$

where Q_{LN} and Q_{HN} are, respectively, the shares of low-skill workers and high-skill workers in the native workforce.

A.5. The Counterfactual Model

Here we build on the fully corrected model of Battisti et al. Our counterfactual model differs from the fully corrected model in two respects: it involves "reasonable" tax rates on wages, and it attends to the problem of insufficient tax revenue by admitting a budget deficit. Specifically, the budget constraint, which in the fully corrected model

and in the Battisti et al.'s paper is given by

$$\sum_i \sum_j b_{ij} U_{ij} + g \sum_i \sum_j Q_{ij} = t \sum_i \sum_j w_{ij} E_{ij}, \tag{A.7}$$

that is, (12) in the Battisti et al.'s paper, is given here in the counterfactual model by

$$\sum_i \sum_j b_{ij} U_{ij} + g \sum_i \sum_j Q_{ij} = t \sum_i \sum_j w_{ij} E_{ij} + BD, \tag{A.8}$$

where U is the number of unemployed workers; Q is the number of workers; E is the number of employed workers; BD is the budget deficit; subscript i denotes a worker's skill type, high or low, $i = H, L$; and subscript j denotes the worker's nationality, native or (im)migrant, $j = N, I$. It follows from (A.8) that the budget deficit BD is measured in the same units as wages, capital, and GDP. To calibrate the values of BD for each of the 20 OECD countries, along with all the other relevant parameters/variables, we initially fix the tax rates on workers' wages at the values calibrated by Battisti et al., which we consider "reasonable" (the average tax rate of the 20 OECD countries is 45.5%). Once calibrated, we fix the values of BD for each country, and we let the tax rate on workers' wages vary in response to the "migration shocks."

References

Battisti, Michele, Gabriel Felbermayr, Giovanni Peri, and Panu Poutvaara (2018). "Immigration, Search and Redistribution: A Quantitative Assessment of Native Welfare." *Journal of the European Economic Association*, 16, 1137–88.

Cahuc, Pierre, Stephane Carcillo, and Andre Zylberberg (2014). *Labor Economics*, 2nd ed. MIT Press.

OECD (2022). *Consumption Tax Trends 2022: VAT/GST and Excise, Core Design Features and Trends*. OECD Publishing.

OECD (2024a). *Corporate Tax Statistics 2024*. OECD Publishing.

OECD (2024b). *Taxing Wages 2024: Tax and Gender through the Lens of the Second Earner*. OECD Publishing.

Pissarides, Christopher A. (1985). "Taxes, Subsidies and Equilibrium Unemployment." *The Review of Economic Studies*, 52, 121–33.

Supplementary Data

Supplementary data are available at *JEEA* online.

Journal of the European Economic Association 2025 0(0):1–18
https://doi.org/10.1093/jeea/jvaf033