Pigou in the Post-Covid-19-Era -
A Tribute on the occasion of the 100th
Anniversary of the Publication of The
Economics of Welfare

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Pigovian Tax – 100th Anniversary

„The Economics of Welfare“ (1920)

Arthur Cecil Pigou
(1877-1959)
Despite Coase, there is a (theoretical) consensus that Pigovian Taxes are a good idea

“It follows that, under conditions of simple competition, for every industry in which the value of the marginal social net product is greater than that of the marginal private net product, there will be certain rates of bounty, the granting of which by the State would modify output in such a way as to make the value of the marginal social net product there more nearly equal to the value of the marginal social net product of resources in general, thus—provided that the funds for the bounty can be raised by a mere transfer that does not inflict any indirect injury on production—increasing the size of the national dividend and the sum of economic welfare; and there will be one rate of bounty, the granting of which would have the optimum effect in this respect.

In like manner, for every industry in which the value of the marginal social net product is less than that of the marginal private net product, there will be certain rates of tax, the imposition of which by the State would increase the size of the national dividend and increase economic welfare; and one rate of tax, which would have the optimum effect in this respect.”

Arthur Pigou,
The Economics of Welfare, 1920 (Ch. XI, §11)

If marginal private benefits are lower than social benefits, there is too little production. A subsidy (bounty) is needed.

In the opposite case, a tax is needed. We refer to the 'optimal' Pigovian tax that maximizes welfare.
There is a diverse group of supporters of Pigovian taxation.

Not paying the cost of damage to the environment is a subsidy, just as not paying the full costs of workers would be.

Fossil fuels must be confronted with their real costs, and polluters must pay if markets are to work [...].

The way to do it [controlling emissions] is to impose a tax on the cost of the pollutants emitted [...].

Yet only when “the economic and social costs of using up shared environmental resources are recognized with transparency and fully borne by those who incur them, not by other peoples or future generations”,[138] can those actions be considered ethical.

The problem is that those who produce the emissions do not pay for that privilege, and those who are harmed are not compensated.

For believers in Pigovian taxation such as myself, the primary task ahead is one of education.
... Yet, they doubt the political viability of Pigovian Taxation

I will use the term Pigovian Taxation in the following sense: With taxation, I refer to direct pricing – in contrast to indirect pricing via emissions trading. A price collar is subsumed under direct pricing.

In what follows, I will defend two claims:

(i) There are sound theoretical reasons for calling the feasibility of Pigovian taxation into question.

(ii) The consensus is somewhat spurious in that the political success of Pigovian taxation is higher than a single-minded focus on the reasons elaborated in (i) would suggest.
The sound part of the consensus: Some reasons for the difficulty of implementing Pigovian taxation

- **Uncertainties** about marginal benefits, e.g. the social costs of carbon.
- **Regressive distributional** impacts on poor households.
- **Fragmented responsibilities** of ministries lead to excessive focus on sector-specific policies and/or technology policies.
- **Commitment problems** might require sector-specific and/or technology policies.
- **Lack of acceptance/commodification objection**: e.g. carbon pricing and carbon markets are perceived as repugnant by some environmental groups.
- **Incomplete** international cooperation.
Beware: The consensus only partially reflects reality

https://carbonpricingdashboard.worldbank.org/map_data
Pigovian taxation in the wild: A brief history in three acts

1) National policies: The German Case

2) EU Climate Policy: Transformation of the energy and transport sectors

3) International Climate Policy: Coal, Capital and Cooperation
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The German National Emission Trading Scheme

- Necessary Mean Growth Rate: 16% p.a.
- Growth Rate: 10% p.a.

Adopted from: Edenhofer, Kalkuhl, Ockenfels (2020)
Distributional concerns are addressed

Adopted from: Edenhofer, Kalkuhl, Ockenfels (2020)

- no compensation
- reduced electricity prices + increased social transfers
- equal per-capita recycling
Inefficient sector-specific policies

Source: Edenhofer et al (2018), based on OECD data
Direct pricing and the virtuous cycle of moral crowding in: Some experimental evidence

Pricing externalities and moral behaviour

Axel Ockenfels, Peter Werner and Ottmar Edenhofer

To measure how moral behaviour interacts with pricing regimes, we conduct highly controlled experiments in which trading creates pollution. We compare indirect pricing (here, a cap and trade mechanism) and direct pricing (a tax) in an otherwise equivalent setting in which ‘producers’ are incentivized to emit CO$_2$. ‘Judges’ decide on central trading parameters that may restrict socially harmful activities. Profit maximization predicts the same producer behaviour in either setting in the absence of regulation, yet we find a substantial share of producers refraining from emitting CO$_2$ at all. Although judges restrict behaviour in similar ways across mechanisms, direct pricing more effectively accommodates moral behaviour than the quantity policy.
Pigou is the Winner: Direct pricing increases voluntary abatement

Fig. 3 | Induced and actual abatement in number of CO₂ tonnes not emitted. Blue bars indicate mean values for the induced abatement (in tonnes of CO₂ not emitted) by the judges’ decisions under the assumption of profit-maximizing producers. Green bars indicate mean values for the actual abatement in 1,000 simulated markets based on observed judges’ and producers’ decisions. The mean value is displayed in each bar. Errors bars represent 95% confidence intervals.

Table 1 | Average outcomes of market simulations per treatment

<table>
<thead>
<tr>
<th></th>
<th>Market price (€)</th>
<th>Efficiency of ex ante abatement: share of inefficient producers that abated (s.d.)</th>
<th>Producer welfare: share of maximum achievable payoffs (s.d.)</th>
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<tbody>
<tr>
<td>CO₂ Frame Auction</td>
<td>2.59 (2.74)</td>
<td>0.717 (0.169)</td>
<td>0.251 (0.223)</td>
</tr>
<tr>
<td>Price Frame</td>
<td>8.46 (2.79)</td>
<td>0.979 (0.104)</td>
<td>0.051 (0.119)</td>
</tr>
<tr>
<td>Fine Frame</td>
<td>7.85 (3.13)</td>
<td>0.912 (0.139)</td>
<td>0.068 (0.176)</td>
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“The world is second best, at best” (Dani Rodrick)

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<th>Steps towards a solution</th>
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<td>Setting prices which are consistent with quantity targets</td>
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<td>Distributional concerns</td>
<td>No per-capita recycling, but reduction of regressive energy taxes</td>
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<td>Repugnant markets</td>
<td>Price floor mimicks direct pricing</td>
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<td>Inefficient sector-specific policies</td>
<td>„Climate Cabinet“ - instead of fragmented responsibilities of ministries</td>
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The European Green Deal – Muddling through

- EU Commission will tighten the emission target to 50-55%.
- Then, Germany has to increase its emission reduction target in the non-ETS sector from 38% to 50%, compared to the 2005 level.

Source: Pahle et al. 2020
Enormous inefficiencies due to sector-specific policies

Data based on OECD (2018)
Multiple externalities – multiple instruments

https://www.mcc-berlin.net/fileadmin/data/C18_MCC_Publications/Policy_brief_Road_Traffic_EN.pdf
Which instruments work and how?

**Rebound Effect**
5–30% of the energy savings are lost because consumers drive their efficient cars more frequently

The European Green Deal – A Pigovian Moment?

- EU Commission will tighten the emission target to 50-55%.
- All additional emission reductions necessary to tighten target in EU-ETS.

Source: Pahle et al 2020
EU ETS lack dynamic cost efficiency

- Market Stability Reserve works in the short term, but may destabilize allowance market in the long-term (Friedrich et. al. 2020)
- “Minimum”-Price might stabilize prices in the long-term!
The EU is the archetypal second-best institution

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<td>Price floor, Market Stability Reserve</td>
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<td>Distributional concerns</td>
<td>Coordinated national tax reform</td>
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<td>Incremental integration of EU ETS and Non-ETS</td>
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<td>Commitment device</td>
<td>Still missing</td>
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<td>Cooperation</td>
<td>Explicit and implicit transfers</td>
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Carbon Pricing on a global scale

- Effective carbon rate (€/tCO₂)
- CO₂-emissions from energy use
- 2020 Minimum carbon price range for the 2°C target: €34 - €68
- Only about 10% of emissions are priced at a level consistent with the 2°C target.
- For almost 50% of emissions, the effective carbon rate is zero.
Widespread lockdowns have reduced emissions – but only to 2006 levels

Fig. 3 | Global daily fossil CO₂ emissions (MtCO₂ d⁻¹). a. Annual mean daily emissions in the period 1970–2019 (black line), updated from the Global Carbon Project⁹ (Methods), with uncertainty of ±5% (±1σ, grey shading). The red line shows the daily emissions up to end of April 2020 estimated here. b. Daily CO₂ emissions in 2020 (red line, as in a) based on the CI and corresponding change in activity for each CI level (Fig. 2) and the uncertainty (red shading; Table 2). Daily emissions in 2020 are smoothed with a 7-d box filter to account for the transition between confinement levels.

Le Quéré et al (2020), NCC
Post-Covid-19 emissions will continue to rise, unless...
Coal-fired plants – large fiscal multiplier?

Expected emissions

Steckel et al (2020)
The problem of the cost of capital

- Contour lines show the expected **share of renewable energies**, given a certain CO$_2$-price and certain capital costs (WACC).

- Vertical lines show the **average capital costs** for investments in renewables in selected countries and regions.

- Capital costs affect the effectiveness of a CO$_2$-price!

*Note: Underlying model calculation (Hirth and Steckel 2016) is calibrated for a typical emerging market.*
The international coal problem at a glance
Counteracting free-riding via conditional transfers

Reciprocity through national carbon prices + transfers establishes cooperation

- Transfers conditional on carbon pricing level $p_i$

- Compensating differences in mitigation costs:

\[
T_i = T \cdot \left( C(p_i) - \frac{1}{N} \sum_{j} C(p_j) \right)
\]

Magnitude of compensation Differences in costs $C$ between countries

- Cooperation established: a member is compensated for additional costs of reducing emissions
  - Free-riding addressed: voluntary targets are ambitious
  - Reward for joining: all other countries increase provision
How an investment fund can be used for transfers

• Example $r_b = 8\%$ bonds issued by Bangladesh; $r_f = 1\%$ (no arbitrage!)

• The risk premium of the country is: $r_b - r_f = 7\%$. Who pays for it?

• The investment fund could finance the risk premium and the costs of capital market frictions; this would require additional tax revenue.

• Despite the risk for the country, investments in green technologies are becoming profitable! In addition to projects, the fund could also finance the introduction of CO$_2$-prices.

• "Green" guarantees (e.g. Hermes guarantees) or insurance schemes for high-risk loans.
Paradigm shift in international climate policy is necessary!

https://doi.org/10.1016/j.euroecorev.2020.103423

Key messages

• Coal is a burden on the global carbon budget, as is the expansion of infrastructure.

• The high cost of capital prevents the expansion of renewable energies and favors coal-fired power plants.

• International Cooperation is needed and – if designed properly – possible!
## Challenges ahead of us

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Uncertainty about price elasticities

![Graph showing emissions in non-ETS sectors](image)

MCC-PIK (2019)
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Horizontal Equity

• Previous work has focused on vertical equity effects of environmental taxes (costs are negatively correlated with income)

• Policy-makers and public debates concentrate more on horizontal effects and hardship cases (who faces particularly high policy costs) (Pizer & Sexton 2019, Fischer & Pizer 2019)

• Research on optimal policy design (differentiated transfers/taxes or non-linear taxes) with horizontal heterogeneity needed (Hänsel et al. 2020)
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<td>Incentives and moral behavior</td>
<td>Crowding in of intrinsic motivations</td>
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<td>Inefficient sector-specific policies</td>
<td>Integration of trading schemes + national tax reform + reform of complementary policies</td>
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<td>Commitment device</td>
<td>Independent European Carbon Bank</td>
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<td>Cooperation</td>
<td>Conditional transfers, negotiation on carbon prices</td>
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<td>Political Economy</td>
<td>Compensation schemes because of concentrated costs and benefits versus dispersed costs and benefits</td>
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Pigou is alive!

• The consensus is not entirely misleading: There are, indeed, thorny problems, casting doubt on the political feasibility of Pigovian taxation. But the consensus unjustly disregards the political successes of the latter.

• Today, 100 years after the publication of Pigou’s *opus magnum*, we see remarkable success stories, even under second-best conditions.

• There is a Pigovian moment within the EU because of its ambitious targets.

• Economists can help significantly to enhance the implementation of the idea. We have to provide more sophisticated research, which goes beyond the obvious.